5.

$$\mathbf{S} = \begin{pmatrix} 1 & 0 & p \\ -1 & 2 & 3 \\ 2 & -2 & 0 \end{pmatrix} \qquad \mathbf{T} = \begin{pmatrix} 2 & 1 & -3 \\ 0 & -3 & -1 \\ q & 0 & 1 \end{pmatrix}$$

where p and q are constants.

Given that $\det \mathbf{S} = \det \mathbf{T}$

(a) show that $p = 5q + 6$

(3)

The transformations S and T are represented by **S** and **T** respectively.

The transformation U, represented by the matrix **U**, is the transformation S followed by the transformation T.

(b) Determine **U**, giving your answer in terms of q.

(3)

The point $(2, -3, 1)$ is transformed by U to the point $(r, 5, 14)$ where r is a constant.

(c) Determine the possible values of q.

(3)

Given that $q > 0$

(d) determine the value of r.

(2)

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Question 5 continued

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Question 5 continued

(Total for Question 5 is 11 marks)